

*Space Science Courses:
Internet Learning
for Science Teachers*

<http://btc.montana.edu/nten>

<http://btc.montana.edu/ceres>





Montana

- 6 persons/mi²
- remote access is essential!



*National Teachers Enhancement Network
(NTEN)
and
Center for Educational Resources (CERES)*

- professional development for middle school and high school science teachers nationwide
- science, math, and science education courses delivered over the Internet
- exemplary web-based instructional materials in space science
- support from NSF and NASA



Current Benchmarks

- 40+ courses developed in sciences, math, education
- 5500 enrollments from 50 states (and outside US)
- “sustainability” demonstrated

On-line courses - Goals

- deepen science understanding for teachers
- practicing scientists working w/ teachers
- make science content relevant to the classroom
- demonstrate “best practices” in science teaching & learning



On-line Courses - Academic Areas

Astronomy & Space Science (CERES)

Biology

Mathematics

Chemistry

Microbiology

Earth Science

Nutrition

Education

Plant Science

Engineering

Physics

Entomology



On-line courses - Style

- asynchronous conferencing
- highly interactive & structured
- emphasis on discussion, collaborative work, real data
- max 25 students per class



CERES Project

Center for Educational Resources (CERES) Project

Through funding from NASA, faculty at Montana State University and classroom teachers from across the nation have developed an extensive library of on-line and interactive K-12 science education materials for teaching astronomy. Closely aligned with the NRC National Science Education Standards, these web based lessons make maximum use of exciting on-line NASA resources, data, and images. In addition to classroom-ready materials using contemporary teaching strategies, CERES has developed several on-line NASA data search engines and two graduate level distance learning courses, available over the internet to K-12 teachers.



NASA Themes	Educational Activities	Classroom Resources
	Internet Courses	About this Site
		Home Page

CERES Goals

- **increase science understanding for K-12 teachers and students**
- **bring NASA-based electronic resources to classrooms**
- **map NASA-based resources to NRC Standards**
- **classroom-ready exemplary classroom activities for students on-line**
- **Internet-based courses for in-service K-12 teachers**
- **remote multimedia development capability**

CERES Courses

Comparative Planetology

Observing the Universe

Astrobiology

Course Characteristics

- **scientist / teacher development teams**
- **integrate pedagogy, content, and resources**
- **on-line, asynchronous**
- **interactive and collaborative learning**
- **modular organization**
- **graduate credit**



NASA/MSU-Bozeman CERES Project

Internet Courses

[Studying the Universe with Space Observatories:](#)

Recent NASA missions have rapidly increased our ability to explore and understand the structure, dynamics and evolution of our universe. Mysteries from the inner workings of stars to the formation of galaxies and the beginnings of the universe itself are being unraveled with each new observation. At the same time, growth of the internet has allowed for rapid and direct dissemination of fundamental discoveries and scientific results to the public, sometimes even as they occur, and often without adequate scientific context or commentary. This course will provide the conceptual and scientific background necessary for understanding and interpreting the results of missions related to galactic and extragalactic space science. There has never been a more exciting time to become knowledgeable and involved in NASA's plan for the exploration of deep space.



Instructor

David M Caditz, PhD is a Visiting Assistant Professor of Physics at Montana State University. Dr. Caditz has performed research in elementary particle physics at Massachusetts Institute of Technology and has held research

Online courses: What's needed

Students need:

- computer with Mac OS or Windows
- Internet connection
- time - these are rigorous, demanding courses

MSU supplies:

- software for conferencing and document exchange
- technical support
- logistical support

On-line course reactions....

- *accessibility*

“ I doubt that I would be able to take this course or one like it any other way ...I live a long distance from the nearest University”

- *interactivity*

“I’m most surprised by the torrents of information that are coming through my computer. Don’t these people have lives?”

And more reactions...

- *collaboration*

“I find the power of this weekly conferencing unmatched by any course or textbook I have read. This medium allows us to resonate and reflect our views.”

- *effectiveness*

“These courses are highly successful ... not because they are electronic but because they are human.”

CERES Astrobiology Course

- Formation of Stars and Planetary Systems
- Origin and Evolution of Life on Earth
- Habitable Zones Around Sun-Like Stars
- Water on Mars and the Martian Meteorite
- Extremophiles I: Hydrothermal Ecosystems in
Yellowstone National Park
- Extremophiles II: Cryogenic Ecosystems in
Antarctica

And....

- Oceans on Europa and the Moons Around Gas Giants
- Methods Used in Search for Extra-Solar Planets
- Analyzing Data on Extra-Solar Planets
- Dissecting the Drake Equation
- Radio Search for Extra-terrestrial Intelligence
- Aligning with the NSES & and NASA Roadmap for Astrobiology Research

CERES Innovative Instructional Materials Development

- keyed to:
 - **NSE Standards**
 - **NASA (OSS) mission statement**
- collaborative teacher/scientist teams
- capitalize on NASA resources
- next-generation educational technologies
- age-appropriate, interactive, classroom-ready
- <http://btc.montana.edu/ceres/>

Sample CERES On-Line Lessons

(combine hands-on and Internet hypermedia)

- Determine Planet Rotation Rates from NASA Movies
- Measure Sunspots and polar ice caps from NASA space probe photographs
- Convert NASA Digital Images to Binary and Transfer Information Electronically
- Use Galactic Redshift Velocities to Determine Expansion Rate of the Universe
- Sequence Hubble Space Telescope Images of Stars to Represent Star Life Lines

CERES/BTC Multimedia Lab

- develop on-line and classroom materials
 - technology training for teachers
- Web-based delivery tools & Web server
 - audio and video digitizing
 - CD-ROM production
 - QTVR
 - archiving and storage of files
 - text and graphics production
 - non-linear video editing
 - video conferencing
 - interactive Web tools



Master of Science in Science Education

- *Who is served?*

Science teachers - middle school and high school.

- *Why another degree program?*

“ I love to teach science. That is what I want to do with my life. I don't want to be an administrator.”

“At last, a degree that meets my needs - understanding science and how to teach it. And I can pursue the degree and keep my job.”

What makes this degree different?

- Intercollege, interdepartmental degree. All students complete a group (15 cr) of core courses (math and ed) and select science courses (15 cr) to fit their needs.
- About 2/3 of courses and credits for the MSSE degree offered by distance - Students are on campus part of two summers and do distance learning for additional 5 terms.

How are things progressing?

- Program now in fourth year.
- Second cohort of 20 graduated in summer 2000.
- About half from Montana, half from other states.
- Admission:
 - Bachelor's in a science or in science education.
 - Undergraduate GPA of 3.0 or higher.
 - GRE scores - minimum of 1500 (V+Q+A)
 - Two years experience teaching science.
 - Certification to teach science.

FirstClass Intranet Client 5.1

File Edit Message Conference Service View Window Help

Desktop

DeskTop 1 File 7 Folders tuthill@msulink.mont



On-Line Courses

Conference 0 Files 7 Folders tuthill@msulink.montana.edu

On-Line Courses


 Fall 97


 Spring Courses '98


 Practice

Spring Courses '98

Conference 0 Files 23 Folders tuthill@msulink.montana.edu

 Science & Photography	 Math 580	 Modern ORG / BIO Chem	 Gen. Relativity 98	 Astronomy 98	 EDUC 680
 Math 535	 EDCI 503	 K-14 Earth Science 98	 Quantum Mech. 98	 Math Visualization	 IM 92
 Plains Landscape	 Comparative Planetology	 Basic Med Terms	 EDCI 406	 Biol 105	 K-14 E. Sci Section 2
 Nursing Research	 EDEL 414		 Olympic Science	 English 121	 Integrated Mathematics

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